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The role of broadband developments financed from EU Structural Funds in the enhancement of regional cohesion in the NMS-10

This paper examines if broadband Internet access ('broadband') developments enhance regional cohesion in ten New Member States (NMS-10) of the European Union. It focuses on broadband developments in these countries financed from Structural Funds (SF). Broadband developments have a potentially beneficial impact. However, while the existence of this beneficial impact is well established in theory, still there is no conclusive evidence empirically. Broadband is perceived here as an essential part of ICT, enabling the spread and use of ICT. The paper analyses (1) the regional dimension of broadband access in the NMS-10, (2) the recognition of broadband-cohesion links by NMS-10 governments, and (3) the priority given to broadband in SF spending. The impact of broadband developments on cohesion is not presently monitored, however it would be essential in order to evaluate the effective use of public resources in the enhancement of regional cohesion.

Keywords: Cohesion Policy, broadband Internet access, ICT, Structural Funds, EU Member States

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Introduction

Cohesion is a key concept in the European Union (EU). Information and communication technology (ICT) may be of help in reducing social divides, thus it can be perceived as a tool for enhancing cohesion¹. While ICT does not automatically bridge social divides (it can even increase them as access to it is mainly dependent on wealth), deliberate policies may help non-users to become users and thus increase their opportunities. The level of broadband Internet access ('broadband') development is a specific area of cohesion, which gains increasing importance with the spread of the use of computers and various internet and web-based applications and can be a key factor in decreasing regional disparities in the field of access to information, knowledge, work, goods and services.

In this paper we use the OECD (Organization for Economic Co-operation and Development) definition for broadband, which defines broadband as 256 kbit/s in at least one direction. Broadband technologies are fixed line or wireless. The fixed broadband technologies are: DSL, cable modem, FTTx/LAN, PLC, WLL and satellite. In the examined ten New Member States (NMS-10, i.e. Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia), but also in the whole EU, the most popular technology is DSL. Therefore, although its market share in the EU-27 decreased from the peak of 81% in January 2006 to 79% in 2009 (EC, 2010a), in this paper we concentrate on this technology.

The business impact of ICT is well established, however empirical evidence to date about the development impact of ICT is inconclusive. Hüsing (2004) showed that in the NMS, besides age, education attainment, gender and health status, internet usage is a factor which significantly influences the risk of unemployment, which is the main source of poverty. According to Maignan *et al.* (2003), the increased use of ICT in the economy is accompanied by greater dispersion of economic activity, and thus may lead to lower regional disparities. However, there is a counterbalancing impact: due

to agglomeration effects the shift towards more knowledge and skill-intensive activities might result in less cohesion.

In the context of development, focusing mainly on developing economies, Brown (2001) and Chowdhury (2000) state that ICT will contribute to an even wider economic divergence between developing and developed countries. Sridhar and Sridhar (2004) demonstrate that the impact of telecommunication penetration on total output is significantly lower for developing countries than for developed countries, resulting more likely in regional divergence than in convergence. On the other hand, Hudson (2001) thinks that the use of wireless terrestrial and satellite technologies may enable developing countries to leapfrog stages of development.

As the above contradictory evidence on the impact of ICT on cohesion shows, there is a need for theories which will deepen our understanding of the relationship between ICT and cohesion (Gomez and Pather, 2010). Policies inducing a more intensive use of ICT may increase cohesion, but ICT policies must be thoroughly balanced and take into account all of the potential beneficial and adverse effects. There are two mechanisms through which ICT may be beneficial (Hüsing, 2004). Firstly, ICT can improve people's access to certain services and subsidies, through enabling them to rely on ICT mediated interactions with the government and public services. Secondly, ICT may enable people to participate more fully in the economy, in political, cultural life and in the society through the ability to use ICT at work, at home and in other environment.

Broadband developments provide one possible channel through which ICT can affect growth, development and thus cohesion. Various studies have shown the (potential) positive impact of broadband on growth and cohesion in the EU. Fornefeld *et al.* (2010) used input-output analysis and case studies to analyse the current and future potential positive impact of broadband on growth and productivity in the EU-27. Codagnone (2009) showed through microeconomic studies and input-output analysis the positive social and economic impact of eInclusion. This is without doubt strongly related to broadband developments as an enabling

¹ Regional cohesion and regional convergence are used as synonyms in the text.

factor through which infrastructural improvements can positively impact upon the society and economy. Another study dealing with eInclusion is Bentivegna and Guerrieri (2010), which demonstrated the positive impact of broadband on eBanking, eTrading, eTravelling and employment, and thus on cohesion. According to Koutroumpis (2009), based on the econometric analysis of the EU-15, there are increasing returns to broadband telecommunications investments which are consistent with the persistence of network externalities.

The digital quality divide is empirically demonstrated between urban and rural areas both in developed and developing countries (Cisco, 2009). Less developed rural and remote areas thus can strongly benefit from broadband developments, as demonstrated among others by Anon. (2003) for healthcare in Australia. Dabson and Keller (2008) showed how rural consumers benefit from online access to goods and services that are not available locally. They showed the positive impact of broadband on the rural economy, both on consumers and firms: for every one percentage point increase in broadband penetration rate, employment is projected to increase by 0.2 to 0.3 percent per year in rural areas of the United States. Annis *et al.* (2005) analysed the economic impact of broadband usage in two small Canadian communities, showing the positive return on broadband investments.

Acknowledging this potentially positive impact of ICT and broadband on cohesion, we concentrate on those policy elements in the NMS-10 which enable the wider use of ICT through broadband developments. ICT policies can support information access in rural areas and as we have seen there is evidence that broadband developments can help lagging rural areas to catch up with developed areas. Within these policy elements, we pay special attention to those areas which are financed from Structural Funds (SF).

Methodology and data limitations

We used data available from the website of DG Regio (EC, 2011). We analysed the 'public aid breakdown of finances by priority areas', because it provides the most suitable data for comparison. The limitations of our methodology and data availability regarding ICT-related and broadband developments financed from SF are as follows:

- At present, comparative data are still limited. As SF are still the most harmonised public investment schemes in the EU, more attention to harmonised collection and analysis of data could provide extremely valuable input for economic impact assessment of broadband investments;
- In the majority of MS there are integrated development programmes, so in many cases the specific broadband developments are part of the framework programmes. Detailed data in most cases are not available for broadband developments²;

- In the EU the National Strategic Reference Frameworks and the Operational Programmes (OP) of the MS are not harmonised, MS can prepare them according to their national culture and structures, thus they do not offer data and information on broadband in the same or similar structure³. In many cases exact data are not available, because of multiannual planning. The data can change continually and according to the planning phase;
- Many MS had to introduce national Recovery Packages and reorganised spending from SF due to the impacts of the financial crisis. Available data on these reorganisations are not reliable and not comparable for the period 2007-2013;
- Reliable information is limited regarding studies on the effective use of public investment under these programmes. Even though the EU requires the monitoring and analyses of SF investments, there are numerous data and measurement problems when trying to analyse the broadband developments related to SF. Many of the reports are not yet prepared, or not public, or not available in English, or not comparable at all.

In view of the above, in addition to the data available from the DG Regio website, we completed our research with interviews with the representatives of the relevant National Authorities of the examined MS (see acknowledgements).

Broadband indicators and markets by settlement types

Broadband penetration rates (subscription) in the NMS-10 grew dynamically between 2004 and 2009, however in 2009 the penetration rates were still below the EU-27 average (Table 1). An exception was Estonia, where the number of broadband access lines/100 inhabitants was 26.3 compared to the EU-27 average of 23.9. Among the NMS-10 Slovenia was also close to the EU-27 average. The penetration rate was the lowest in Bulgaria (and in Romania) in 2009, although the country leads the EU in broadband penetration growth with an annual growth rate of over 228% (Anon., 2009).

Alongside the fixed technologies, the market share of (wireless) mobile broadband has grown significantly, the take-up in the EU increased by 115% between January 2009 and January 2010. The number of new mobile broadband products offered by mobile operators doubled in 2009 (EC, 2010a). At the same time the percentage of population using mobile phone via UMTS (3G, third generation of mobile telephony (cellular) technology) to access the Internet in the NMS-10 was relatively low, below the EU average (which was 4%); the two exceptions were Slovakia and Slovenia. Laptop usage was more popular in 2009, the proportion of

² In some cases there is a dedicated priority for broadband e.g. in Slovakia the OP 'Information Society' includes a specific priority 'Improvement of broadband internet access', but in most cases only wider information society priority data are available, and in these cases we could not estimate the proportion of broadband developments, because detailed data are not given at the level of specific measures. In some MS the amount spent on the development of eGovernment services and the amount for broadband infrastructure differ extremely within the measure.

³ The hierarchy of initiatives is as follows: National Strategic Reference Framework/Single Programming Document/National Development Plan defines the overall strategy, then it is divided into OPs. In most cases these exist at a sectoral and/or regional level. OPs are broken down to priorities which include several measures.

Table 1: Broadband indicators in the Eastern EU Member States, 2009 (* 2008).

Broadband indicators	BG	CZ	EE	HU	LV	LT	PL	RO	SK	SI	EU-27
Total DSL coverage (% of total population)	85	92	94	95	89	89	75	74	82	93	94
DSL coverage in rural areas (% of total population)	33	85	80	89	67	69	52	45	54	85	80
Speed (% of broadband subscriptions above 2 Mbps)	96	100	52		82	63	34		81		
*3G+ coverage (% of total population)	50		62	73	48	59	19	30	62	77	
% of households with an internet connection	30	54	58	55	58	60	59	38	62	64	65
% of households with a broadband connection	26	49	54	51	50	50	51	24	42	56	56
% of enterprises with (fixed) broadband access	70	78	88	76	62	58	58	41	78	85	83
% of population using a mobile phone via UMTS (3G) to access the Internet	1	1	2	2	1	2	2	0	10	9	4
% of population using a laptop via wireless connection away from home/work to access the internet	4	3	16	8	9	8	10	2	16	11	17
Broadband penetration (number of broadband access lines per 100 inhabitants)	11.9	17.8	26.3	17.2	17.5	18.2	12.8	12.3	14.3	22.1	23.9

Source: European Commission (2010): Europe's Digital Competitiveness Report ICT Country Profiles Vol II.

population using a laptop via a wireless connection was 17% in the EU-27; regarding the NMS-10 it was between 2% and 16%. The two highest proportions were observed in Estonia and Slovakia.

Differences are large not only among MS, but also within a MS. In the NMS-10 there are large gaps between regions in terms of broadband access, which in turn influence their economic and social development. We used the settlement types (at NUTS 3 level) of broadband coverage and take-up in EU 27+2⁴ (phase III) project as follows:

- urban area (over 500 inhabitants per square km);
- suburban area (between 100-500 inhabitants per square km);
- rural area (under 100 inhabitants per square km).

We analysed the NMS-10 according to these settlement types (Figure 1). We can distinguish the following types of countries: (1) dominated by urban centres; (2) the role of capital cities is important but not dominant.

Countries dominated by urban centres

The Baltic States can be characterised by the dominant role of the capital cities (Tallinn, Riga, Vilnius) and some urban regions with medium-sized towns in the centre (Tartu, Narva and Parnu in Estonia; Daugavpils, Liepaja, Jelgava, Rezekne, Jurmala and Ventspils in Latvia; Kaunas, Klaipeda, Siauliai and Panevezys in Lithuania). Over 50% of the total population is settled in the urban centres and the role of capital cities is rather high in terms of total population (30% in Estonia, 35% in Latvia, Vilnius and Kaunas together almost 25% in Lithuania). The high share of larger cities and spatial concentration of the population enable the service providers to build up the high-speed data communication infrastructures of broadband internet use for a large share of population with smaller investments. The innovative nature of the population in capital cities is well documented in the geographical and economic literature in transition studies on NMS-10 which is why the higher concentration of population in urban centres involves higher and more intense use of all types of communication infrastructure and services.

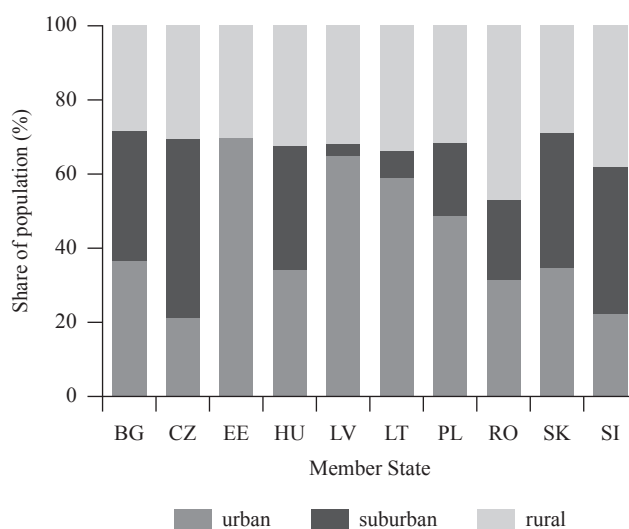


Figure 1: Share of population by settlement types in Eastern EU Member States in 2008.

Note: In 2007 the Bulgarian settlement structure was: urban: 36.4%, suburban: 34.7%, rural: 28.9%; the Romanian structure was: urban: 31.3%, suburban: 21.4%, rural: 47.3%, using the original definition of the settlement categories. Based on the data from national authorities.

Source: EC (2010e)

Countries where capital cities are important but not dominant

Bulgaria, the Czech Republic, Poland, Romania, Slovakia, Hungary and Slovenia are characterised by a more balanced settlement structure. The share of total population in the capital cities is as follows: Praha: 12%; Warszawa: 5%; Bratislava: 8%; Budapest: 17%; Ljubljana: 14%. There are important large and medium-sized centres in the countryside, forming smaller urban regions. The role of small towns and villages is important in the settlement hierarchy; one-third of total population is concentrated in settlements with less than 5000 inhabitants. The size of countries and the importance of lower levels of settlement hierarchy result in different types of network building and development. In case of Bulgaria and Romania the broadband coverage data and the data for their segmentation into urban and rural categories are mostly estimated. Due to this, data may not reflect the exact state of the development of broadband internet markets in these countries.

⁴ EU 27+Iceland and Norway

Broadband coverage by settlement types

At the end of December 2008, DSL coverage of urban areas was almost 100% in the NMS-10; the three exceptions were Bulgaria, Poland and Romania (Figure 2). DSL coverage of suburban areas was over 80% in Slovenia, Slovakia, Latvia, Lithuania, Czech Republic and in Hungary. In Bulgaria, Romania and Estonia there are no data for 'suburban' category. The DSL coverage of rural areas was over 80% in Slovenia and Hungary; however the low level of coverage in rural areas is still the most important problem in these countries. Based on Figure 2, three types of national markets can be defined:

- Without large differences: Estonia, Hungary, Slovenia
- With sharp inequalities: Bulgaria, Poland, Romania, Slovakia
- With significant, but moderate disparities: Czech Republic, Latvia, Lithuania

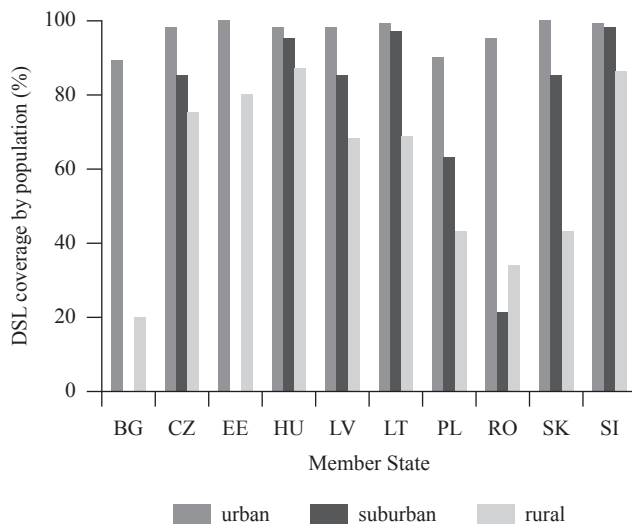


Figure 2: DSL coverage by population in settlement types in Eastern EU Member States in 2008.

Source: EC (2010e)

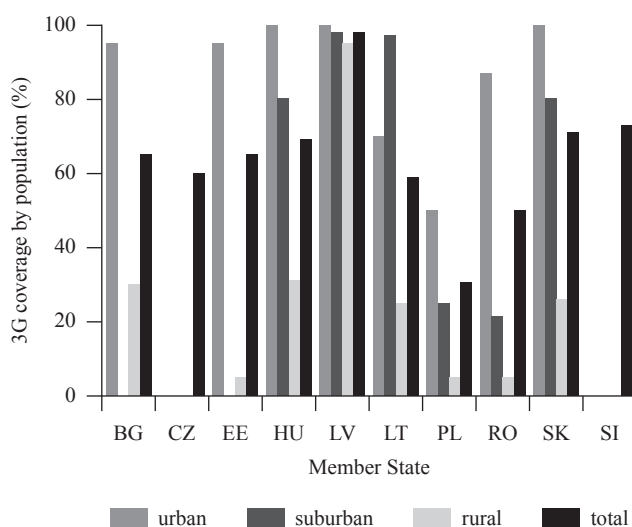


Figure 3: 3G coverage by population in settlement types in Eastern EU Member States in 2008.

Source: EC (2010e)

The overall level of coverage heavily depends on the settlement structure. The average coverage of the population is around 60-70% (the two extremes being Latvia with 98% and Poland with 31%), however, the accessibility of mobile broadband services is changing from year to year. 3G coverage is increasing. In Latvia the rural, urban, suburban areas are at the same level in terms of 3G (Figure 3). In Estonia, Poland and Hungary the 3G coverage is very low in rural areas. In some MS 3G coverage is relatively low not only in the rural areas, but also in the urban areas, for example in Lithuania and Poland.

Broadband developments from Structural Funds

Regarding State Aid Policy the European Commission (EC) gives preference to aid measures which target rural and underserved areas, but it is more critical with aid measures in areas where a broadband infrastructure already exists and competition takes place (EC, 2009).

EU resources are widely used for funding broadband developments. Among these SF are the most important alongside private funding. Eastern European MS can utilise these funds for broadband infrastructure, and for various related areas such as for eLearning, eInclusion etc. National funding is very limited, due to several factors, including the heavy burden of co-financing for the incoming SF. The financial instruments for broadband developments usually come from the ERDF (European Regional Development Fund). In addition to the support from SF the EC decided to inject EUR 1.02 billion into the European Agricultural Fund for Rural Development (EAFRD) as part of the Recovery Package. The 35% of the EU Recovery Funds (EUR 360.4 million) which will be used for deploying broadband infrastructures in rural areas was approved between October 2009 and January 2010 (EC, 2010b).

For the 2007-2013 EU financing period, EUR 2.3 billion of SF was allocated to broadband infrastructure investments and EUR 12.9 billion to information society services; and a further EUR 360.4 million via the EAFRD were used for broadband funding in the EU-27. This follows clarification in 2009 of state aid rules on use of public funds for broadband deployment which enables national and regional authorities to plan their own infrastructure projects (EC, 2010c). Furthermore, the European Investment Bank has an important role in broadband developments, it invests EUR 2 billion each year (EC, 2010d) into economically viable broadband projects in Europe and this is likely to increase as part of the wider Europe 2020 strategy.

Thus there are several EU financing sources for broadband projects but as far as the efficiency of these are concerned, we can quote Neelie Kroes (Vice-President of the EC responsible for the Digital Agenda), according to whom, the Cohesion Funds and the Rural Development Funds have not been used efficiently in the past for broadband development, but the Digital Agenda will change this (Kroes, 2010).

Here the NMS-10 broadband related developments from SF are analysed based on evidence from lists and details of projects/policies aimed at broadband developments.

Table 2: Operational Programmes relating to broadband Internet developments in the Eastern EU Member States (MS) in the programming periods 2004-2006 and 2007-2013.

MS	2004-2006	2007-2013
BG	Not applicable. Bulgaria joined the EU in 2007.	OP 'Administrative Capacity' (OPAC) Priority axis 'Quality of administrative service delivery and e-government development'. The total amount is EUR 56.04 million: EUR 47.64 million EU contribution, EUR 8.41 million national public contribution.
CZ	'Joint Regional Operational Programme' (JROP) Measure 2.2. The total sum to be paid for the development of information and communication technologies in the regions is EUR 22.5 million.	'Integrated Operational Programme' is relevant in broadband developments. The total amount is EUR 1235.80 million: EUR 1050.43 million EU contribution, EUR 185.37 million national public contribution.
EE	Operational Programme 'Infrastructure and Local development' priority 4.5 targeted the development of the information society, and the improvement of broadband infrastructure. EUR 8.3 million was allocated under this Measure, of which the co-funding of ERDF amounted to EUR 6.2 million and the Estonian match funding to EUR 2.1 million.	Operational Programme 'Development of Economic Environment' Priority 5th 'Promotion of information society'. The total amount is EUR 62.6 million for the information and communication technology accessibility, safety, interoperability, research, innovation, furthermore services and applications for citizens for eHealth, eGovernment, eLearning, eInclusion.
HU	'Economic Competitiveness Operation Programme' (ECOP) under the Priority 'Development of information society and economy' contained a specific action on the development of broadband infrastructure. The EU financial contribution to the programme (ECOP) amounted to EUR 429 million; within this the Priority 'Development of information society and economy' amounted to EUR 137.27 million.	Within the OP 'Economic Development' Priority axis 'Development of a modern business environment', EUR 225.5 million addresses the following: establishing a modern ICT network infrastructure, business site development and providing consulting services to enterprises.
LV	The total amount of OP 'Territorial Cohesion' is EUR 269.2 million; within this the amount for telecommunication and ICT was only EUR 4.01 million.	OP 'Infrastructure and Services', under priority 3.2. 'Territorial Accessibility', Measure 3.2.2. 'ICT Infrastructure and Services' involves broadband developments. For the broadband related developments the total budget is EUR 239.85 million.
LT	Among the priorities under 'Productive Sector and Services', the amount allocated for 'Development of Information Services' was EUR 46.3 million EU contribution and EUR 17.02 million national public contribution.	OP 'Economic Growth', Priority axis 'Information society for all' involves EUR 240.08 million EU contribution and EUR 42.37 million national public contribution.
PL	'Integrated Regional Operational Programme' is relevant regarding broadband developments. Poland spent EUR 124 million for ICT development.	OP 'Innovative Economy' Priority axis 'Information society – increasing the innovativeness of the economy' and the OP 'Development of Eastern Poland' priority axis 'Information Society Infrastructure' is relevant. The planned amount for broadband developments within these axes is EUR 1716 million.
RO	Not applicable. Romania joined the EU in 2007.	The priority 'Increasing of economic competitiveness and development of the economy based on know-how' of the Romanian National Development Plan, third priority axis includes 'The Information and Communications Technologies for private and public sectors'. Almost EUR 445 million of funds will be invested in developing modern broadband networks and e-services for business and citizens in Romania.
SK	Operational Programme 'Basic Infrastructure' Priority 3 'Local infrastructure' was relevant in broadband developments. The amount of this priority was EUR 122,314,834 and a part of this amount (the exact amount is unknown) was used for broadband developments.	There is one dedicated OP 'Information Society Operational Programme for Slovakia' that deals with ICT and broadband issues. Priority 3: 'Improvement of broadband internet access' (approximately 9.7% of total funding) is relevant in broadband developments.
SI	Priority no. 1 'Promoting Productive Sector and Competitiveness', more specifically its measure 1.4 'Economic Infrastructure and Related Services' objective was 'establishing ICT infrastructure that secure high speed broadband, internet connectivity for research, education and business environments'. The exact amount spent for broadband is unknown.	For the period 2007-2013 operational programmes of Slovenia are: OP Strengthening Regional Development Potentials, OP Development of environment and transport infrastructure. The amount allocated for telephone infrastructures (including broadband networks) were EUR 70.01 million.

Source: DG Regio, European Commission, information from the National Agencies

Overview of broadband objectives and policies in NMS-10

Most of the NMS-10 determined specific OPs which include broadband developments, but some did not specify such a programme, and in this case the broadband developments are part of a wider Information Society OP (Table 2). Thus, although the improvement of ICT infrastructure is a key priority in all NMS-10, in some of them the overall broadband strategy is missing, or only a wider information society strategy exists.

In **Bulgaria**, in November 2009 the new Government adopted a National Broadband Strategy for the period 2010-2013, which defines broadband as access to voice, data and video at a recommended minimum speed of 1 Mbps. However a more detailed programme concerning regional broad-

band availability, the overall scope of broadband projects and private sector co-financing is still not prepared. The most important project financed from SF is the 'National Electronic Communication Network', the optical infrastructure among regional and major cities and integration of Bulgaria's network with European optical infrastructures by 2015.

In the **Czech Republic** the current strategy for development of electronic communications appeared in January 2010, with the title of 'Digital Czech Republic'. The strategy will lay down the measures for facilitating access to broadband Internet throughout the country. It will address the topics of digital television broadcasting and spectrum management, and take into account the implementation of the EU telecoms rules into Czech law. It should give impetus to the use of various services such as eGovernment, eLearning and eHealth services and support the development of digi-

tal interactive TV. One of the specific aims of the strategy is to address the issue of the digital divide by proposing a procedure through which the Government could effectively reduce the phenomenon, after having first identified its extent in the country.

In **Estonia** the Information Society Strategy was launched for the period 2007-2013. The Government approved the amended version of the 'Estonian Information Society Strategy 2007-2013' in July 2009. The update concerns measure 4.1.1. 'Broadening technological access to digital information', to which a chapter was added on the development of broadband internet. The most important project financed from SF was the nationwide superfast broadband network. The main aim is that the 90% of the country have access to the 100 Mbps network by the end of 2012, with the remainder of the population to be connected by 2015.

In **Hungary** the National Broadband Strategy was approved by the Government in 2005. Its main aims are the development of broadband communication targeting the improvement of life quality, the increase of competitiveness, as well as strengthening social cohesion between 2007 and 2013. Access to broadband networks receives support in the underdeveloped and disadvantaged regions, resulting in extended coverage and improved information security in Hungary. The main objectives of the strategy are divided into the following intervention areas:

- The increase of the use of broadband Internet – population, enterprises, public institutions;
- The widening of the relevant choice of contents – public institutions, enterprises;
- The assuring of equal opportunities – disadvantaged groups.

The website www.broadbandsearch.eu, operated by an independent foundation and called HBSE (Hungarian Broadband Search Engine), was set up to provide updated information on broadband offers and related conditions nationwide. The engine was developed as part of an 'INTERREG 3B' project, with the aim to address the European market and strengthen eInclusion.

In **Latvia** the current broadband strategy is the 'Broadband network development strategy 2006-2012'. Its objective is to ensure, by 2012, broadband access at affordable price for several target audiences (natural persons, state administration institutions, businessmen, schools, hospitals) covering 80 % up to 95 % of the country's territory.

Under the OP 'Promotion of Territorial Cohesion', the main aim of the measure 'Development of Information and Communication Technologies' is to develop the conditions for competitive and socially inclusive use of information and communication technologies over the territory of Latvia, setting the basis for development of the information society. It targeted support to the development of nation-wide information systems for public use (e.g. municipal, education, library, archive and museum information), including digitalisation in order to improve the quality of provided services. It supports the development of public internet access points (e.g. in public libraries, municipalities, education institutions) and the development of information and communication in peripheral areas by extending high quality broadband network.

Lithuania's broadband strategy entitled 'Development Strategy of the Broadband Infrastructure of Lithuania for 2005-2010' was approved in 2005. Its main objective was the development of broadband networks and access in those locations where such services are unavailable or in such locations which are uncompetitive in terms of provision of wideband connection networks. The main broadband projects financed from SF and other public resources in the country are:

- *The Rural Area Information Technology Broadband Network projects (RAIN 1, RAIN 2 and RAIN 3).* The strategic aim of RAIN 1 was to decrease the digital divide between urban and rural areas and thus accelerate the development of the knowledge society in Lithuania. The value of the project amounted to EUR 21.5 million, half of this sum was granted by the ERDF under measure 3.3. 'Development of Information Technology Services and Infrastructure'. The other half was granted by the Republic of Lithuania. The main objective of RAIN 2 was to create an infrastructure of electronic networks to allow all public administration institutions and agencies in rural areas, as well as all interested small and medium sized business enterprises and all residents, to use the services of broadband at an affordable cost. The broadband infrastructure is planned to be used by different departments for the promotion and development of various activities in rural areas. These issues are scheduled to be discussed within the framework of RAIN 3.
- *Project Establishment of Broadband Data Transmission Network in the Municipalities of Lazdijai and Alytus Regions.* The project was also financed by ERDF measure 3.3. which covered more than 75% of the project cost of EUR 1.94 million.
- *Project Information Society Development by Installing Broadband Wireless Radio Communications Network in Neringa.* Of the total project cost of EUR 1.7 million 70% were covered by the PHARE programme. The remainder came from the national budget. The aim of the project was to install a broadband wireless radio communications system and provide the opportunity for townships that belong to Neringa municipality, Nida, Preila, Pervalka and Juodkrante, to have high speed Internet, telephone communications and data transmission.

In **Poland** the National Development Strategy 2007-2015 defines six main priorities, one of which emphasises that implementation of SF should promote the information society for all. In particular it is important that an appropriate broadband communication infrastructure be available across the country at an accessible cost.

In Poland there are also Public-Private Partnership (PPP) projects in the field of broadband developments, for example 'PPP Project Malopolska Broadband Network in Poland'. The main objective of the Malopolska Broadband Network (MBN) project is to increase the coverage of broadband in the region so it reaches at least 90.5% of households and 100% of private companies and public institutions by mid-2012. The MBN project will be carried out by the local authorities

Table 3: Public resources of broadband developments in Eastern EU Member States, EUR.

Member State	Total funding for Structural Funds + Cohesion Fund (EUR million)		Funding for broadband developments, (EUR million)		Funding for broadband developments/capita (EUR million)
	2004-2006	2007-2013	2004-2006	2007-2013	2007-2013
Bulgaria		6,853		89	11.70
Czech Rep.	1,270.758	26,692	22.5	1,235.8	118.06
Estonia	804.44	3,456	8.3	62.6	46.70
Hungary	2635.4	25,307	429	225.5	22.48
Lithuania	1,360.792	4,620	4.01	239.85	106.07
Latvia	1,812.807	6,885	63.5	282.45	84.32
Poland	11,563.819	67,284	124	1716	45.00
Romania		19,668		445	20.70
Slovakia	1,372.232	11,588	122.32	113.18	20.91
Slovenia	523.226	4,205	n.a.	70.013	34.45

Source: Regional Policy – Inforegio; Poland: <http://www.funduszestrukturalne.gov.pl/English/>; Hungary: www.nfu.hu; Division of resources by MS: http://ec.europa.eu/regional_policy/policy/fonds/index_en.htm; Population data: www.oistu.org

of Malopolska Region and its total budget is around EUR 40 million. The project consists of deployment by the Malopolska Region of broadband infrastructure in the areas where market forces do not and will not provide such infrastructure due to a lack of profitability. The network will complement the existing, belonging to various operators, infrastructure, and will be open access, i.e. available to all telecommunication operators under transparent and non-discriminatory conditions. The infrastructure will comprise passive elements (ducts, chambers, dark fibres, etc.) as well as co-location facilities (where operators will be able to install their equipment) necessary to establish and maintain the broadband network. The infrastructure will altogether form the MBN. The project does not *a priori* favour any specific technology. However, the preliminary analysis suggests that the optical fibres are an optimal choice. The scope of investment will be determined for each county separately and will depend on the size of the market failure in the specific area. The created infrastructure will be owned by the Malopolska Region and the private partner will be selected in an open tender. The latter will be responsible for designing, building and operating the MBN, and will be an infrastructure operator.

Romania did not take part in SF between 2004 and 2006, but for the period 2007-2013 it receives more than EUR 30 billion for investments in almost all the economic sectors. The broadband development is one of the categories which can be financed from SF. There is no dedicated strategy for the broadband developments.

In **Slovakia** the broadband strategy was adopted in 2005, titled 'National Strategy for the Broadband Access'. Its main objective is to achieve the level of developed European MS within the next 5 to 8 years. Slovakia is one of the least developed EU MS in terms of broadband access. One of the main reasons for this is the inadequate development of networks. The relevant OP concentrates on the least commercially attractive areas as a means of ensuring universal access.

In **Slovenia** the main aim of the National Broadband Strategy was to ensure broadband for all by 2010, and access speeds of at least 2 Mbps to 98% of the population by 2012. The Single Programming Document for Slovenia defines the development of information society as a horizontal priority; all measures have to take full advantage of IS services in terms of eligibility and in terms of improving access, use

and affordability of ICT. Measures: modernising the public sector; stimulating demand in the private sector; developing content; raising digital skills. The only vertical priority relevant to the development of the information society has been priority no. 1 'Promoting Productive Sector and Competitiveness', more specifically its measure 1.4. 'Economic Infrastructure and Related Services'. Its objective has been 'establishing ICT infrastructure that will secure high speed broadband, internet connectivity for research, education and business environments'. For the period 2007-2013 the OPs of Slovenia are: OP Strengthening Regional Development Potentials, and OP Development of Environment and Transport Infrastructure. The amount allocated for telephone infrastructures (including broadband networks) was EUR 70.013 million.

In most NMS-10 broadband related developments increased in 2007-2013 (Table 3). The two exceptions were Hungary and Slovakia, but in these countries the amount for broadband developments for the period 2004-2006 included other information society related developments, so in fact we cannot really speak about a decrease.

For the period 2007-2013 broadband related developments represented a significant proportion of the available funds, amount to 1-9% of the total amount of SFs (and Cohesion Fund). For the period 2004-2006 Slovakia spent the biggest proportion of SF on broadband developments (8.9%), and in the period 2007-2013 the Czech Republic, Latvia and Lithuania will spend the largest proportion of SF on broadband developments.

With respect to population, the amount for broadband developments/capita in the period 2007-2013 is the highest also in the Czech Republic, Latvia and Lithuania. The lowest broadband developments/capita indicator in this period was noticeable in Bulgaria, Hungary, Romania and Slovakia.

Discussion and conclusion

The role of capital cities in the economies of NMS-10 is crucial, more important than in the EU-15. This is also true for Internet use and access to broadband. The share of rural population and its importance in the country's settlement structure is significant, although the rural population seems

to be less innovative and lagging behind in broadband coverage and the use of more developed service packages. Different settlement structures call for different IT development strategies, regional and IT policies, particularly concerning broadband. The key questions are: how to bridge the digital gap among settlement types, hierarchical levels and in some cases among regions and localities; how could broadband developments influence the cohesion, the level of employability, access to the information, access to the eServices including health, education and vacancies. Projects financed from SF assist these targets.

Our research is a work in progress. In this paper we collected on the one hand data on regional disparities in broadband and, on the other, we tried to put together details in all NMS-10 of projects/policies aimed at broadband developments, but our opportunities were limited to a great extent.

Regional disparities regarding broadband access and the spatial structure of broadband markets in NMS-10 were and are still huge. There is a spatial hierarchy in broadband developments as well, where there is a decrease of broadband access from the top of the hierarchy (usually the capital cities) to the bottom (rural areas). Moreover, until now broadband developments financed from public resources supported outdated technologies and, according to Neelie Kroes, the Cohesion Funds and Rural Development Funds have not been used efficiently for broadband developments. Thus a decline of the relative digital divide could not result, even though the broadband related expenditures increased in the period 2007-2013 in most NMS. On the basis of our analysis, in the future it is important to invest only in the state-of-the-art technologies, if we are to support under-served rural areas.

Regarding the type of the broadband developments the most important fields of funding from SF in the NMS-10 are: the development of rural areas, Next Generation Access networks, superfast broadband networks. In some countries there were specific projects related to broadband, e.g. in Bulgaria the development of optic infrastructure among regional and major cities and integration Bulgaria's network with European optical infrastructures by 2015. The development of superfast broadband networks received priority in Estonia, but it is important everywhere.

We conclude that without effective national sectoral and regional policies, the gap between rural and urban areas will not decrease. The relative digital divide is this persistent, even though in most of the NMS-10 broadband related expenditures increased in the period 2007-2013.

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References

- Annis R.C., McNiven, J. and Curri, M. (2005): Industry Canada. Broadband Economic Impact Study. Final Report. Brandon: Brandon.
- Anon. (2003): The Economic Impact of an Accelerated Rollout of Broadband in Hospitals. Canberra: Access Economics.
- Anon (2009): Bulgaria Leads Europe in Broadband Growth - October 2009 Bandwidth Report [www document]. <http://www.websiteoptimization.com/bw/0910/> (accessed 15 August 2011).
- Bentivegna, S. and Guerrieri, P. (2010): Analysis of e-Inclusion impact resulting from advanced R&D based on economic modelling in relation to innovation capacity, capital formation, productivity and employment. Brussel: European Commission.
- Brown, M.M. (2001): Can ICTs Address the Needs of the Poor? New York: UNDP.
- Cisco (2009): Global Broadband Quality Study Shows Progress, Highlights Broadband Quality Gap [www document]. http://www.cisco.com/web/MT/news/09/news_021009a.html (accessed 15 August 2011).
- Chowdhury, N. (2000): Information and Communications Technologies and IFPRI's Mandate: A Conceptual Framework. Washington DC: IFPRI
- Codagnone, C. (2009): Vienna Study on Inclusive Innovation for Growth and Cohesion: Modeling and demonstrating the impact of e-Inclusion. Brussel: European Commission.
- Dabson, B. and Keller, J. (2008): Rural Broadband. A RUPRI Policy Brief. Columbia: Rural Policy Research Institute.
- EC (2009): Communication from the Commission: Community Guidelines for the application of State aid rules in relation to rapid deployment of broadband networks. Official Journal of the European Union C 235/07-C 235/25, 30.09.2009.
- EC (2010a): Europe's Digital Competitiveness Report ICT Country Profiles Vol. II. SEC(2010) 627. Brussel: European Commission.
- EC (2010b): Rural development: €5 billion in total injected into rural development programmes following last vote on Health Check and Recovery package changes [www document] <http://europa.eu/rapid/pressReleasesAction.do?reference=IP/10/102&format=HTML&aged=0&language=EN&guiLanguage=en> (accessed 10 March 2011).
- EC (2010c): A Digital Agenda for Europe. COM(2010) 245. Brussel: European Commission.
- EC (2010d): European Broadband: investing in digitally driven growth. COM(2010) 472. Brussel: European Commission.
- EC (2010e): Broadband Coverage in Europe: Final Report: 2010 Survey: Data as of 31 December 2009. Brussel: European Commission.
- EC (2011): Regional Policy – Info regio [www document]. <http://>

- ec.europa.eu/regional_policy/index_en.cfm (accessed 10 March 2011).
- Fornfeld, M., Delaunay, G. and Elixmann, D. (2010): The Impact of Broadband on Growth and Productivity: A study on behalf of the European Commission. Düsseldorf: MICUS.
- Gomez, R. and Pather, S. (2010): ICT Evaluation: are we asking the right question? Paper presented at the International Development Informatics Conference, IDIA 2010, Cape Town, South Africa.
- Hudson, H.E. (2001): Access to the Digital Economy: Issues for Rural and Developing Regions. Telecommunications Management and Policy Program. San Francisco: University of San Francisco.
- Hüsing, T. (2004): The Impact of ICT on Social Cohesion. Looking Beyond the Digital Divide. Empirica Schriftenreihe. Report 02/2006. Bonn: Empirica.
- Koutroumpis, P. (2009): The Economic Impact of Broadband on Growth: A simultaneous approach. Telecommunications Policy **33** (9), 471-485.
- Kroes, N. (2010): Broadband investment in a difficult economic climate [www document]. <http://europa.eu/rapid/pressReleasesAction.do?reference=SPEECH/10/537&format=HTML&aged=0&language=EN&guiLanguage=en> (accessed 10 March 2011).
- Maignan, C., Pinelli, D. and Ottaviano, G.I.P. (2003): ICT, Clusters and Regional Cohesion: A Summary of Theoretical and Empirical Research. Nota di Lavoro 58.2003. Milano: Fondazione Eni Enrico Mattei.
- Sridhar, K.S. and Sridhar, V. (2004): Telecommunications infrastructure and economic growth: Evidence from developing countries. Applied Econometrics and International Development. **7** (2), 37-56.